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MEMORANDUM

TO: Tom Lorz, CRITFC
Eric Hockersmith, COE
FPAC

FROM: Michele DeHart

DATE: November 9, 2016

RE: Comments on "Examination of Ice Harbor Dam BiOp performance standard evaluation assumptions" by Harnish et al. (2016)

At your request, we have reviewed Harnish et al. (2016), "Examination of Ice Harbor Dam BiOp performance standard evaluation assumptions." We have several concerns regarding the use of the ViRDCt design, outlined below and followed by further detail. In addition to concerns specific to this test, we also found that the study does not address many of the problems associated with performance testing and the performance standard approach that we have identified in the past. These concerns are also outlined below. The FPC has reviewed and provided comments on all of the performance standard tests conducted to date. Reviews of these tests indicate that the significant technical and implementation issues with performance standard testing raise serious doubts regarding the management application of results. In addition, a substantial body of scientific analyses indicate that performance standard tests and the performance standard approach is underestimating the effect of FCRPS projects on life-cycle survival, given that delayed effects of bypass passage are not included in performance standards testing. Performance standard testing requires a large tagging effort and a substantial commitment of funds. Given the questionable management application of results, the wisdom of further pursuit of the performance standard approach and further commitment of funds to performance standard testing should be carefully considered.

Concerns specific to the ViRDCt design and Ice Harbor performance testing include:

- Dead fish releases, critical for the calculation of survival estimates, were released only through the RSW. Given that survival estimates are calculated for all routes of passage,

dead fish releases from a single location will not provide an appropriate correction for the run-at-large.

- Currently, spill operations at Ice Harbor Dam alternate in two day blocks between 45 Kcfs day/gas cap night and 30%. There is no discussion of how alternating operations may affect the survival, detection probabilities, and effects of dead fish corrections.

- Past performance standard evaluations have not used a standard number of dead fish releases, or a justification for the number used in each test. It is unclear how the correction for dead fish detection is comparable between years and sites.

- It is not clear how detection probabilities in the tailrace arrays, p_1, were estimated in the ViRDCt model. In this pilot study, estimates from previous virtual-paired release studies were used. How future analyses would estimate detection probability is not explained.

- The ViRDCt model, first outlined in this report, is not directly comparable to results obtained using the virtual-paired release of past performance testing.

    - The ViRDCt design uses a very short reach between the dam and detection array when compared to past performance testing. This may result in inflated survival estimates when compared to previously generated estimates.
    - Although there is overlap in the confidence intervals when comparing the two methodologies, subyearling Chinook estimates from 2013 increased by 5% when reevaluated with the ViRDCt design, moving from below the standard to far exceeding the standard of 93%. The way that a new methodology can significantly increase survival estimates for some groups must be fully evaluated.

- To change the experimental design so significantly would mean that new studies cannot be compared to other locations or past years. Before moving forward with an altered experimental design, a serious evaluation of past and future testing, with consideration for systemic biases, should be conducted.

Concerns previously expressed regarding performance testing include:

- Tagging requirements for size and condition require the exclusion of much of the run-at-large. In particular, the reevaluated survival estimates for Little Goose and Lower Monumental performance testing includes a rejection rate of 18% for subyearling Chinook. Rejection rates for either tag type were not included in this report. For more detail on this topic, please see FPC memos from June 24, 2009; March 24, 2011; February 15, 2012; March 23, 2012; January 4, 2013; February 11, 2013; March 19, 2013; March 22, 2013; December 3, 2013; January 14, 2014; May 2, 2014; and February 3, 2015.
- The tag burden for subyearling Chinook was as high as 4.29% and averaged 3.48%. Tag burdens of this level may impact smolt behavior and swimming ability. For more detail on this topic, please see FPC memos from June 24, 2009; March 24, 2011; February 15, 2012; and March 19, 2013.

- Performance testing, which attempts to measure dam passage survival, does not include a multitude of impacts of dam passage that is expressed in higher mortality following dam passage. Constant revision of the methodology will not change the fact that performance testing cannot represent the impacts of the hydrosystem on adult returns. For more detail on this topic, please see FPC memos from June 24, 2009; July 29, 2010; February 15, 2012; March 16, 2012; March 23, 2012; January 4, 2013; December 3, 2013; May 2, 2014, and February 3, 2015.

Overview of ViRDCt design

The ViRDCt methodology differs from the previously used virtual paired-release design with the elimination of the R_2 and R_3 release groups, and the use of the tailrace array (one to two kilometers downstream) as a detection point. The numbers of dead fish detected by the tailrace array have not been included or reported in previous studies, but in the ViRDCt model they are used to generate correction factor for the single-release survival estimate. The dead fish correction is calculated using the same methodology as the single dead fish detected at the downstream array at Little Goose Dam in 2012, but the correction is much higher due to moving the detection array closer to the tailrace of the dam.

Dead fish released only through the RSW

The releases used to calculate the dead fish correction in the ViRDCt design were released only through the RSW, although the correction factor would be applied to all routes of passage in a full performance test. In past performance tests, the location of the dead fish releases have been either through the spillway or not reported. It is unknown if passage route affects the detection probability of dead fish, because it has not been studied. Given that the run-at-large will use all routes of passage and the detection of dead fish can have a significant impact on survival estimates in the ViRDCt design, further exploration of passage routes and detection probabilities will be critical before implementation of this study design.

Alternating operations at Ice Harbor Dam

Alternating operations at Ice Harbor Dam can, under certain flow conditions, create high variability in spill levels. This report does not include an analysis of how changing operations and flow conditions may impact the detection probability of dead fish, and so it is impossible to know how the dual operation will affect survival calculations and required sample sizes.

There has been discussion among fisheries managers about a single operation at Ice Harbor, to be decided prior to starting performance testing in 2018. A single operation would reduce the variability and required sample sizes. However, as no single operation has been decided on, the impacts of alternating operations at Ice Harbor should be considered for performance testing.

Inconsistent use of dead fish releases in previous performance testing

In performance testing from 2011 to 2014, the details of dead fish releases were not reported. In mainstem performance testing in 2012, there is no mention of dead fish releases or potential detection. In other years, the number of dead fish range from 9 to 32 for each species, with no clear distribution of dead fish releases across times or operations. A clear procedure for dead fish releases was requested in a Joint Technical Staff Memo from fisheries managers on

February 20, 2015, but no further information has been provided. Additionally, the dead fish detections from the tailrace array have not been reported before, so it is not possible to estimate the impact the ViRDCt design would have at other locations.

Results of new study design would not be comparable to existing performance testing results

Because the ViRDCt design uses detections from the tailrace array, not previously used in performance testing, and so survival estimates are generated for a much shorter reach. As expected, some estimated survivals for the shorter reach are higher than the virtual paired-release design. It is important to note that this does not actually represent an improvement in concrete survival, but a substantially different metric for measuring survival. Upon reexamination of the 2012 and 2013 Little Goose and Lower Monumental data, Harnish et al. (2016) notes that the confidence intervals from the two methods overlap in 7 of 8 instances and use this observation as evidence that results from these two methods do not differ significantly. However, the fact that the ViRDCt design resulted in a single group, subyearling Chinook at Little Goose Dam in 2013, with a survival estimate that increased by 5% indicates that the ViRDCt methods represents a different type of survival estimates from the previously approved virtual paired-release methodology. Furthermore, it is concerning when the use of a new study design results in a performance metric that shifts from not being met to being met, as occurred for subyearling Chinook at Little Goose Dam in 2013. The ViRDCt design should not be considered a modification of the approved performance testing design, but a significant change that should be thoroughly evaluated before implementation.